

explaining its function in scientific method, and naturally giving prominence to J. S. Mill, though also quoting Whewell, Bain, Jevons, Alfred Sidgwick, and Welton. Book iii. consists of useful examples of scientific procedure, drawn from the investigations of White of Selborne, A. R. Wallace, Darwin, Harvey, Lord Avebury, and others; while book iv. deals with some elementary principles of science-teaching, and has some very sensible remarks on heuristic methods. The section on Bacon is particularly good, and the famous idols are lucidly explained. Indeed, the whole book is a model of clearness. If it has a fault, it is in the direction of excessive quotation; but this is difficult to avoid when an author is exceptionally well read, and it has the compensating advantage of giving the young student a wide range of actual "samples," some of which may lure him to the study of the authors themselves.

(2) This volume contains papers by Bertrand Russell, Percy Nunn, Boyce Gibson, Dawes Hicks, W. R. Sorley, James Ward, Bernard Bosanquet, and others, on the relations of universals and particulars, animism and the doctrine of energy, the experience of power, the time difficulty in realist theories of perception, and purpose and mechanism. Perhaps the most interesting to the man of science—particularly in view of Prof. Schäfer's British Association address and the various comments thereon—is the symposium on purpose and mechanism. Prof. Sorley, instancing a workman laying the bricks in house-building, points out that the purposive process involves (1) no creation or annihilation of matter, but only rearrangement of masses; (2) no creation or annihilation of energy; (3) no violation of the law of causation; but that it is by no means established that the laws of mechanics are valid also for purposive action; e.g., the laws of motion do not explain the bricklayer. It is "ideal guidance"—guidance by the idea of the house or its parts, existing in the bricklayer's mind—that determines the place of each brick. Purposive action implies certain things which are inconsistent with fundamental principles of mechanics. "Energy is liberated, that is, passes from the potential to the kinetic form, as the result of a purpose, or mental idea, and the same purpose may control the direction of the movement. . . . If purposive action is a reality, then mechanism is an abstract or limited system, and cannot give an adequate account of the real process of things."

Mr. A. D. Lindsay, criticising, remarks that we cannot introduce a non-mechanical into a mechanical system, however much we may insist that it is only a little one; but, at the same time, we can maintain that the mechanical explanation

will apply to every part of the human organism, while still holding that this is not a full account of the matter. The discussion was continued by Dr. Bosanquet and Prof. James Ward.

(3) A paper by the late Dr. Ameghino describes fossil remains of two human beings found on the Atlantic coast, 60 kilometres north of Necochea. The skeletons were small, almost pigmy, say about 1.40 metres, and of small build as to strength; skulls small, and decidedly dolichocephalic: frontal part small, face prognathous. Other articles discuss intellectualism and pragmatism, the psychology of criminals, and multiple personality. J. A. H.

GENERAL AND ECONOMIC GEOLOGY.

- (1) *Earth Features and their Meaning.* An Introduction to Geology for the Student and the General Reader. By Prof. W. H. Hobbs. Pp. xxxix + 506. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1912.) Price 12s. 6d. net.
- (2) *A Geological Excursion Handbook for the Bristol District.* By Prof. S. H. Reynolds. With an Introduction by Prof. C. Lloyd Morgan, F.R.S. Pp. 224. (Bristol: J. W. Arrowsmith, Ltd.; London: Simpkin, Marshall and Co., Ltd., 1912.) Price 3s. 6d. net.
- (3) *An Introduction to British Clays, Shales, and Sands.* By A. B. Searle. Pp. xi + 451. (London: C. Griffin and Co., Ltd., 1912.) Price 7s. 6d. net.
- (4) *Graphical Solution of Fault Problems.* By C. F. Tolman, jun. Pp. 43. (San Francisco: Mining and Scientific Press; London: Mining Magazine, 1911.) Price 4s. 6d. net.
- (5) *Observations on the West of England Mining Region.* Being an Account of the Mineral Deposits and Economic Geology of the Region, and forming Vol. xiv. of the Transactions of the Royal Geological Society of Cornwall. By J. H. Collins. Pp. xxiv + 683 + 18 plates. (Plymouth: Wm. Brendon and Son, Ltd., 1912.)
- (6) *Types of Ore Deposits.* Edited by H. Foster Bain. Pp. 378. (San Francisco: Mining and Scientific Press; London: Mining Magazine, 1911.) Price 8s. 6d. net.

(1) **P**ROF. HOBBS describes his new volume as "a series of readings," the substance of a course of lectures in expanded form. The title concisely expresses the character and scope of the work. The author discusses the figure of the earth, and lays stress upon the tetrahedral hypothesis. He touches lightly on rocks and their mode of formation; deals with earth movements, volcanic action, weathering, and the activities of

water and ice, desert conditions, and the characteristics of lakes and mountains. A separate chapter is devoted to the Niagara Falls as a clock of geological time. He hints that a large amount of original and unpublished material is interwoven in the older web. This may be, but much of it has either been skilfully concealed, or it has a familiar look. The book is quite pleasant reading, and the pleasure is enhanced by the abundant and excellent illustrations. There are five appendices; two on the determination of common minerals and rocks are unsatisfactory and not necessary in a book of this kind. The third describes the author's method of explaining the meaning of contoured maps by means of apparatus; it seems an elaborate way of passing the student's time. The fourth is a short explanation of apparatus for teaching the interpretation of geological maps; it consists of different shaped blocks, representing outcrops of various kinds, to be disposed on a table ruled into squares. This might be useful in setting examination exercises. The fifth outlines several fairly lengthy geological trips in the United States, and concludes with a sketch of a geological rush across Europe.

(2) A different series of geological excursions is provided for by Prof. Reynolds in his admirable little guide book. Forty excursions, all within easy distance of Bristol, are described on a uniform plan under the headings "special features," "access," "general structure," followed by, in each case, an itinerary with geological notes and a short list of references. There are numerous sketch maps and sections and an introduction to the geology of the district is written by Prof. Lloyd Morgan.

(3) The literature on British clays and sands is so meagre that any serious attempt to deal with the subject is welcome. The frontispiece to Mr. Searle's book, a "map of the chief clay works in Great Britain," is fairly characteristic of much that is to follow; it presents a medley of dots conveying no information of any value whatever, but representing, no doubt, a great deal of labour. It would be incorrect to suggest that no information can be gained from the text; Mr. Searle has produced a book containing much useful and interesting matter; one who can stand the fatigue and irritation caused by the lack of arrangement and the interminable repetitions will be able to extract a great deal. Only about half the volume is devoted to the geological position, the qualities and uses of British clays, and the small amount of space allotted to sands is not sufficient to warrant any mention in the title. The remainder of the book is concerned with ordinary geology and with the properties of clays in general. Much

of the geology might have been condensed or omitted; it is very bookish, and it would be easy to point out many statements that are misleading or only half true. There are chapters on the mineral and other constituents of clays; the physical and chemical properties of clays (the table of analyses is quite inadequate); materials similar to clay (including halloysite, sillimanite, kyanite, zeolites, &c.); prospecting, mining, and quarrying; the purification and preparation of clays and the legal position of clays. There is a large but not quite trustworthy index. Throughout the work there are scarcely any references to original authorities, though many are mentioned.

(4) Prof. Tolman's small book of less than fifty pages deals with a subject of the greatest importance to all practical geologists and mining engineers. In most English text-books the movement on fault planes is usually treated as if it were quite simple, though everyone is aware that it has often been very complicated. The author explains very briefly, and on the whole clearly, how to represent the effects of faulting. He uses for this purpose two methods: the isometric projection, and the application of contouring. He introduces several terms in the nomenclature of fault movements which will be familiar to readers of American geological literature; his use, however, of the expression "pole" for axis is not fortunate. The book would have been more satisfactory in some respects if the author had permitted himself a little more elaboration in the treatment of the subject; it is none the less a useful pamphlet.

(5) On the mining region of Cornwall and Devon Mr. Collins has produced a valuable work of reference. Perhaps the most acceptable portion will be that giving short histories of individual mines. There is also a separate list of mines arranged alphabetically. A large part of the volume is occupied with theoretical matters of the usual kind, mingled with which is more interesting local information as to the character of the ore bodies. Occasionally the author launches out into elaborate estimates of the amount of certain minerals and ores contained in the rocks; they are neither of much use nor very accurate.

(6) It was an excellent idea to gather into a single volume the opinions of different mining engineers upon the type of ore formation with which each was most familiar. Separate chapters of this book are given to the Clinton iron ores, Lake Superior iron ores, the flats and pitches of the Wisconsin lead and zinc district, lead and zinc deposits of the Ozark region, native copper deposits, the Cobalt district of Ontario, the Treadwell mines, Alaska, saddle reefs, contact deposits,

the Witwatersrand conglomerates, replacement ore bodies, outcrops of ores, causes of ore shoots. A great deal of the information has appeared before, and there is naturally a certain amount of divergence of opinion among the writers.

OUR BOOKSHELF.

Leitfaden zum Bestimmen der Vögel Mittel-Europas, ihrer Jugendkleider und ihrer Nester nach leicht und sicher erkennbaren Merkmalen. By Prof. F. Dahl. Pp. viii+162. (Berlin: Gebrüder Borntraeger, 1912.) Price 5.20 marks.

THE existing handbooks of bird-classification and description are deficient in three important particulars. They are inexact and incomplete on the distinction between immature, mating and ordinary adult plumages. Descriptive adjectives, such as "short" and "long," which have none but a relative application, are used instead of absolute descriptions. Lastly, the study of nidification is very unsatisfactory. Such defects are the cause of much error and waste of labour to the student.

Prof. Friedrich Dahl, in his guide to the birds of Central Europe, seeks to remedy these defects. It is a model of compression; its 154 pages, each fully paragraphed and subdivided, contain a very complete and well-ordered fund of data. The determination of species is the main object; the subject of life-habit is untouched. The study of nests has a section to itself. This department, naturally, is the less complete. Reference is made in every case throughout the guide to the descriptions and illustrations of Naumann.

An introductory section tabulates those crucial details of beak and pinion and claw which form the elements of classification and render the morphology of the bird unique in biology. These are well illustrated, though on too small a scale in many cases. The book is indispensable as a supplement to Naumann, and English students should make acquaintance with its method.

A. E. CRAWLEY.

Celluloid: Its Manufacture, Applications, and Substitutes. By Masselon, Roberts, and Cillard. Translated from the French by Dr. Herbert H. Hodgson. Pp. xx+356. (London: Charles Griffin and Co., Ltd., 1912.) Price 25s. net.

THIS work, which must be judged in its English rendering, conforms with the forecast of the preface. It is a fairly complete account of celluloid manufacture, with a somewhat hesitating *exposé* of its technological basis. The authors acknowledge the collaboration of M. L. Clément in contributing (1) a theoretical study of nitration baths, and (2) a discussion of the "inflammability" of celluloid. The attendant risks of manufacture, storage, and use are treated, with full reference to the researches of Will, Vieille, Voigt, and others. Their own conclusions from the established data, in the form of "Precautions to be

exercised in Celluloid Works," are practical and comprehensive.

The work is logically subdivided into:—Part i. "Manufacture," which comprises the processes involved in the production of the celluloid mass; Part ii., "Applications," deals with the production of celluloid articles, combs, handles, hollow articles, beads and buttons, and also films, including lacquers and the application of celluloid solutions in the production of filmed, or coated, and impregnated fibres; Part iii., "'Uninflammable' Celluloid and Substitutes," treats of modified celluloids, and the competing varieties of plastic colloids, such as the cellulose acetates, and xanthates (viscoid), as well as casein (galalith) and aldehyde-phenol derivatives (bakelite). In this section the authors modestly confess the insufficiency of their knowledge and information, and we shall not be thought hypercritical in remarking that this section is not to be taken "seriously."

There are unusual additions to our terminology; "pulpation" and "centrifugaliser" are instances of new words, which, however, are intelligible. But in the section dealing with the fibrous nitrocelluloses, we have "pile" (Fr. *pile*) for beater, "paste" (Fr. *pâte*) for pulp, and for the essential working parts of the beater we have "cylinder," or "drum" for roll, "slab" for bed-plate, "teeth" for bars. The general effect produced on the reader is that of *translated French*, which is not English.

The work appears at a moment which is opportune, in view of the appointment of a Royal Commission to inquire into the dangers of celluloid. The authors have dealt fully with this subject.

Atlas Photographique des Nuages. By Julien Loisel. (G. Thomas: Librairie Astronomique, Paris, 1912.) Price 18 francs.

THIS atlas contains twenty plates of beautiful reproductions from evidently very fine negatives, the size of each being $6\frac{1}{2} \times 4\frac{1}{2}$ inches. The letter-press accompanying them is extremely brief. It consists of twenty-three lines describing the methods adopted in securing the negatives, and three or four lines of description of each photograph, forming an index to the plates, in which is stated the type of cloud, general description of the formation and date of exposure.

The photographs were for the most part taken by Dr. Loisel, but they include some reproductions from negatives secured by M. L. Teisserenc de Bord, of Trappes, and by M. J. Vincent, of Uccle.

The cloud nomenclature used in this atlas is not that adopted by the International Meteorological Committee in their International Cloud Atlas, but it would have been an additional value to the present atlas if the international classification terms had been added in each case.

The photographs are so good and represent such typical clouds that the atlas should, and no doubt will, find a place not only in all meteorological institutions, but in the libraries of all interested in this fascinating application of photography.